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## GEOLOGY AND PALEONTOLOGY.

**The Limestones of the Jenny Jump Mountains, New Jersey.**—Accompanying the report on the Archean Geology of New Jersey, by Mr. J. E. Wolff is a paper by Mr. L. G. Westgate on the Geology of Jenny Jump Mountain, chiefly interesting on account of the conclusions reached by the author concerning the crystalline limestones of that region.

The area under consideration embraces the northern half of Jenny Jump mountain in Warren county, New Jersey. This mountains lies along the northwestern border of the highland area, and is a sort of outlier or peninsula reaching into the later Paleozoic rocks. The main ridge of the mountain consists of gneisses; the limestone occurs at its extreme northeastern end, with outcrops along the southeast border of the mountain.

The author discusses in detail the position, lithology and relations to the crystalline limestones in other parts of New Jersey, and reviews the views of previous writers as to the age of the Sussex county limestone, which has generally been considered the type and representative of other localities. Mr. Westgate's views are given in the following summary:

"The crystalline limestones of Warren county are believed to be distinct from and older than the blue magnesian limestone of Cambrian age, which occurs along the northwestern side of the New Jersey Highlands. They are believed to be distinct, for the following reasons."

"1. They differ lithologically from the blue limestone in being thoroughly crystalline, and in containing large amounts of accessory metamorphic minerals."

"2. They are intimately associated with and apparently interbedded with the older gneisses; and gneisses occur also interbedded in the limestone."

"3. They show no intimate association in areal distribution with the blue limestone, nor any tendency to grade into it."

"4. The metamorphic changes to which the white limestones have been subjected are general in their nature, and are not due to the action of the eruptives by which they are cut; so that no sufficient agent is at hand to account for the supposed change from blue into white limestone."

"The white limestones are believed to be older than the blue Cambrian limestone, because (1) they occur in intimate association with the gneisses which are of admitted pre-Cambrian age, and because (2) they have been subjected to general metamorphic forces resulting in great changes, of which the neighboring blue limestone shows no traces."

"That the other crystalline limestones of New Jersey are of the same age as those of Warren county, has not been proved. The theory has generally been that they are. If they are, and if the position taken in the present paper is valid, then the crystalline limestones of Sussex county, and of other places in New Jersey, would also be, as they have generally been supposed to be, of pre-Cambrian or Archean age." (Ann. Rept., New Jersey State Geologist for 1895. Trenton, 1896.)

**Unios from the Trias.**—Four new Triassic Unios are described by Mr. C. T. Simpson. The collection of which they form a part was obtained from the Dockum beds, a formation underlying the Staked Plains of Texas. Taken as a whole, these Unios closely resemble in form, and are apparently nearly related to those of the Jurassic beds of North America, while 3 of the species bring to mind most strongly the species which now inhabit Europe and western Asia, and a small group belonging to the Mississippi area. The variety of characters displayed by these Triassic Unios go to show that the genus must have been well established at the time the Dockum beds were laid down, thus tending to overthrow Neumayer's theory that the Unionidæ were derived from the genus *Trigonia*, which probably does not date back to a period earlier than that of the shells under consideration. (Proceeds. U. S. Natl. Mus., Vol. XVIII, 1895.)

**The Cadurcotherium.**—M. Boule calls attention to the recent discovery of the lower jaw of a *Cadurcotherium* (Gerv.) at Barlière (Haut-Loire). The specimen denotes an animal of the size of a small rhinoceros. It was found in oligocene arkoses associated with a fine mandible of *Elothierium magnum*, and fragments of *Aceratherium*, and the remains of turtles. Until now *Cadurcotherium* has been represented by isolated teeth and fragments of mandibles. The new find is important, showing the animal to be unique among its contemporaries. It presents certain resemblances to South American types—noticeably *Astrapotherium* of the Patagonian Eocene, but is, according to Osborn really related to the rhinocerotonic genus *Metamynodon*.

**Notes on the Fossil Mammalia of Europe, V—The Phylogeny of Anoplotherium.**—The early attempts at the construction of a phylogeny of the even-toed ungulates, included the genus *Anoplo-*

*therium*, which was considered by Paleontologists of twenty-five years ago, as a primitive form, especially in its foot structure, *Anoplotherium* certainly possesses a number of primitive characters in its manus and pes, such as the separation of the metatarsals, and the non-fusion of the podial elements, but the inadapative reduction of its digits, as pointed out by Kowalevsky and the peculiar position of the pollux and hallux, excludes the possibility of placing *Anoplotherium* in the direct line leading to any of the living Artiodactyla.

I propose in this short paper to attempt to prove, that *Anoplotherium* has been probably derived from *Dacrytherium*, a closely allied genus, but whose foot structure is normal and which resembles that of many of the early Eocene Artiodactyla such as *Cainotherium*. Prof Cope<sup>1</sup> suggested that *Cebochærus* may have been the ancestor of *Anoplotherium*, but the structure of the skull in *Cebochærus*, is already quite modernized, nearly as much so as in the true pigs, consequently I am inclined to think that we shall have to look for some other form as ancestral to *Anoplotherium*.

The general form of the skull in *Dacrytherium* is like that of *Anoplotherium*, however, in *Dacrytherium* there is a strongly pronounced pre-orbital fossa, which is absent in *Anoplotherium*. The crowns of the upper teeth in *Dacrytherium* are low and primitive in structure. They exhibit rounded external crescents, which are not at all angular. In *Anoplotherium*, especially the large species, the crowns of the superior true molars are more lengthened than in *Dacrytherium* and the external crescents are angular and broad. We see this change in many mammalian phyla from extremely low crowned molars, to those which are tending to the hypselodont condition. As regards the intermediate stage, between *Dacrytherium* and *Anoplotherium*, as to the height of the molars, this is found in the genus *Diplobune*.

The lower true molars of *Dacrytherium* exhibit two internal cones, which is the normal number in the Artiodactyla. It is interesting to record, that I have noticed in a number of young jaws of *Dacrytherium* in which the true molars were just coming through, that the antero-internal cusp, which is single in the adult, shows a slight reduplication, which is the normal condition in *Diplobune*. The division of the metaconid is carried still further in the largest species of *Anoplotherium*, although I have examined many jaws from the Phosphorites of the *Anoplotherium*, and I can confidently state, that all gradations exist between the complete isolation of the two antero-internal cusps of the typical forms of *Anoplotherium*, and the single condition of these cusps,

<sup>1</sup> Artiodactyla, AMERICAN NATURALIST, Dec., 1888, p. 1083.

which is found in the supposed ancestral genus, *Dacrytherium*. Accordingly I am not acquainted with any good generic character at present, which will distinguish the so-called genus *Diplobune* from *Anoplotherium*, as in many cases in jaws from the Phosphorites, it is impossible to say whether they belong to *Anoplotherium* or *Diplobune*. Dr. Henri Filhol informed me that he was of the same opinion, in regard to the validity of the genus *Diplobune*.

In *Dacrytherium* the hind foot has at least four well developed toes and the internal digit is not placed at an angle with the others as in *Anoplotherium*. This structure of the pes is just what one would expect to find in a genus standing in ancestral relationship to the more specialized members of the *Anoplotheriidae*. Granting that *Dacrytherium* fulfills in most of its characters, what we require of a form, supposed to be ancestral to *Anoplotherium*, there is still the presence in *Dacrytherium* of a preorbital fossa, which is absent in the skull of *Anoplotherium*, and also another objection, is, that *Dacrytherium* has claw-like ungual phalanges, much as in *Agriochærus*. I believe, however, the extremely compressed ungual phalanges of *Dacrytherium* is of little weight against this genus being ancestral to *Anoplotherium*, for in the latter these phalanges are rather compressed, more so than in the normal Artiodactyles, and they could be easily derived from those of *Dacrytherium*. The structure of the skull is not known in all the species of *Anoplotherium*, and one of them may have had a skull with a preorbital fossa, which is so characteristic of *Dacrytherium*.

As is well known, the original specimens of the manus and pes of *Anoplotherium commune*, which are in the Muséum d'Histoire Naturelle, Paris, show only two well developed digits as restored by Cuvier. This restoration of the feet of *Anoplotherium* is shown by Schlosser and Zittell to have been an error on the part of Cuvier, and I quite agree with these authors on this point. Prof. Zittell in his "*Traité de Paléontologie*" in speaking of the structure of the feet in *Anoplotherium* remarks "La plupart des représentation de la patte d'*Anoplotherium* faites jusque à présent omettent par erreur à la patte antérieur l'index et le rudiment de pouce, à la patte postérieur le second doigt." I have examined a fine cast of the hind foot of *Anoplotherium commune* and I find that the restoration of the internal portion as completed by Cuvier is quite erroneous. The two small bones placed by him on the tibular side of the pes do not at all fit the facets on which they are placed. The broad and obliquely placed facet on Mt. 111 in *A. commune* is for the large and wide spreading second digit, this same structure of the metatarsal occurs in *A. (Eurytherium) latipes* of the upper Eocene of Débruge.

Summing up the principal changes which have occurred in the evolution of *Anoplotherium* from *Dacrytherium*, I emphasize the following: 1. Increase in height of the crowns of the upper molars, and the reduction of the metaconid of the lower molars, this division of the metaconid is found in an incipient condition in young jaws of *Dacrytherium*. Complete separation of the metaconid into two distinct cusps only occurs in some forms of *Anoplotherium*. 2. The hind foot of *Dacrytherium* is normal in structure, and has at least four toes, this is the primitive type of pes, from which the specialized foot of *Anoplotherium* has been derived.

**Note.**—In my “Notes on the Fossil Mammalia of Europe,” part III, AMERICAN NATURALIST, April, 1896, I find two mistakes, which should be corrected. On page 309, third and fifth lines from top, read *Adriotherium*, instead of *Adiotherium* as printed, and also page 310, eighth line from the bottom, read *Anoplotheriide*, in place of *Suillines*. —CHARLES EARLE.

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## BOTANY.<sup>1</sup>

**De Toni's Sylloge Algarum.**—Dr. De Toni<sup>2</sup> has recently issued the third volume of his *Sylloge Algarum*. It deals entirely with the Brown Algae or *Phaeophyceae*—the *FUCOIDÆ* as he calls them. A thousand species are described under one hundred and eighty genera, which are grouped into twenty-nine families. He divides the group into three orders, *Cyclosporinae*, (*Fucaceae*) *Tetrasporinae* (*Dictyotae*) *Phaeozoosporinae* (*Phaeozoosporae*).

*Splanchnidium rugosum* the interesting plant which after careful study was placed by M. O. Mitchell and F. G. Whiting<sup>3</sup> in the *Phaeosporinae*, is retained in the *Durvilleaceae*, the fruit being described as a polysporous oogone. The general appearance of the plant and the structure of the conceptacles suggest a close relationship with the fucoids, but if the above investigations are to be accepted the plant

<sup>1</sup> Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska.

<sup>2</sup> *Sylloge Algarum Omnium Hucusque cognitarum* by J. Bapt. De Toni, Vol. III, *Fucoidae*.

<sup>3</sup> On *Splanchnidium rugosum* Grev. the type of a new order of Algae, Phycological Memoirs, Pt. I. I., 1892.